

## TECHNOLOGY FEATURE

# Electric and Propane Vehicles: Efficient Alternatives for City Driving

Two DOE-sponsored competitions solidly demonstrated that alternative-fueled vehicles can compete with their gasoline-powered counterparts when it comes to fuel economy. The electric and hybrid-electric vehicles (EVs and HEVs) that competed in this year's American Tour de Sol road rally achieved excellent efficiencies, especially under urban driving conditions. The vehicles entered in the Propane Vehicle Challenge also obtained good fuel economy and ranges. Vehicles in both competitions achieved low emissions levels.

### Fuel Economy

In the May 16 American Tour de Sol, whose course stretched from New York City to Washington, D.C., two EVs built by Solectria Corp. in Massachusetts set range records.

Not only did a Solectria Sunrise (lightweight, purpose-built) set the preproduction EV range record of 373 miles on a single charge, a Solectria Force NiMH (Geo Metro converted to run on electricity) set the record for production EVs by traveling 244 miles on one charge. The Sunrise also achieved the best daily efficiency for a conventionally configured EV—102 mpg. The best overall efficiency for an EV—82 mpg—was achieved by a Solectria Force entered by the Northeast Alternative Vehicle Consortium and EVERmont.

HEVs were entered as a separate class in the 1996 American Tour de Sol. In the road test, a converted Ford Escort wagon entered by the University of Wisconsin achieved the highest efficiency for an HEV—49 mpg over a whole day's driving.

In the first Propane Vehicle Challenge ever held, 12 college teams entered 1996 Chrysler minivans that they had converted from gasoline to dedicated propane operation. The Propane Vehicle Challenge was held on May 30 through June 3 in Windsor, Canada, at the Chrysler Canada and University of Windsor facilities.

Vehicle ranges were measured during the June 3 road rally that ran from the University of Windsor/Chrysler Automotive Research and Development Centre in Windsor to Superior Propane offices in Toronto, Ontario. The distance was just over 250 miles; remaining onboard fuel was measured to extrapolate the vehicle's range. Winning entries met the range goal of at least 250 miles (400 kilometers) with no problem, and the University of Texas-El Paso entry achieved an incredible estimated range of 716 miles upon refueling. The best in fuel economy on the dynamometer was the University of Alberta entry, which achieved 22.8 mpg over the standard Federal Test Procedure (FTP) highway cycle (31.2 mpg gasoline equivalent).

## ATdS Road Rally

### Day 3 Efficiencies\*

Wisconsin	49 mpg
Virginia Tech	42 mpg
Neon Control Vehicle	29.75 mpg
Force NiMH	78 mpg
Sunrise	102 mpg

*\*All efficiencies from ATdS are for full-fuel-cycle.*

## 1996 Propane Vehicle Challenge

### Emissions (g/mi)

School	NMHC	CO	CO <sub>2</sub>
Texas A&M	0.06	0.67	0.27
GMI	0.1	1.26	0.25
UTEP	0.26	0.07	0.25
Alberta	0.13	0.22	0.32
Texas Tech	0.57	2.91	0.22
U. of Windsor	0.04	0.21	0.21

### Emissions

In the American Tour de Sol, an HEV entered by Western Washington University achieved 1997 California ULEV (ultra-low-emission vehicle) emission levels on the standard FTP cycle. In the Propane Vehicle Challenge, both the Texas A&M and GMI entries met low-emission vehicle (LEV) standards, while the entry from the host school, the University of Windsor, met the 1997 California ULEV standards.

*For more complete coverage of the two competitions, see articles on pp. 3 and 5.*

Marita Moniger  
Technical Communicator  
Argonne National Laboratory

## IN THIS ISSUE

- Technology Feature ..... 1
- DOE Report ..... 2
- Technology Brief ..... 3
- Team Spotlight ..... 4
- Competition Highlight ..... 5
- Competition Updates ..... 6-7
- School Outreach ..... 7
- Competition Calendar ..... 8

**FUTUREDRIVE**  
 Volume 2, Number 2, Summer/Fall 1996

**Purpose**

To inform past, present, and potential sponsors, participants, organizers, volunteers, and others interested in DOE-sponsored vehicle competitions about the plans for and results from the competitions.

We welcome submissions but reserve the right to edit them. Information in FutureDrive may be reproduced for publication with acknowledgment to FutureDrive, Argonne National Laboratory. Address correspondence, subscription requests, and changes of address to:

Cheryl Drugan  
 FutureDrive  
 Argonne National Laboratory  
 Energy Systems Division, Bldg. 362  
 9700 South Cass Avenue  
 Argonne, IL 60439  
 Phone: (630) 252-1877  
 Fax: (630) 252-1393

**Contributors**

Shelley Launey, Philip Patterson, Bob Larsen, Nicole LeBlanc, Carlos Buitrago, Scott Sluder, Cheryl Drugan, Marita Moniger, Mary Fitzpatrick, and Kevin Brown.

FutureDrive is published by the Energy Systems Division, Argonne National Laboratory, with publishing support services provided by Argonne's Information and Publishing Division.  
 Art Direction/Design by Tami Sharley.



Printed on Recycled Paper

Argonne National Laboratory is operated by The University of Chicago for the U.S. Department of Energy (DOE) under contract No. W-31-109-Eng-38. Accordingly, the U.S. Government retains a non-exclusive, royalty-free license to publish or reproduce the published form of this contribution, or allow others to do so, for U.S. Government purposes.

This publication was prepared as an account of work sponsored by an agency of the U.S. Government. Neither the U.S. Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the U.S. Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Government or any agency thereof.



## FutureCar Challenge Debuts in Dearborn



**S**tudent teams struck a delicate balance between insurmountable challenge and unlimited possibility at the first FutureCar Challenge, which was held June 17-24 in Dearborn, Michigan. Twelve university teams took mid-size production vehicles (donated by Chrysler, Ford, and GM) and converted them to vehicles that achieved higher baseline fuel economy, with a goal of 80 mpg. Teams had 10 months to reach this goal without sacrificing performance, air quality, safety, or passenger and luggage space.

While most teams experienced the considerable adversity associated with a first-year competition vehicle, there were many successes, and the Challenge ended on a high note. Congratulations to:

**First Place:** *Virginia Tech*

**Second Place:** *Lawrence Technological University*

**Third Place:** *University of Wisconsin-Madison*

**Fourth Place:** *Ohio State University*

Of the four top scoring teams, three—Virginia Tech, Lawrence Tech, and University of Wisconsin—designed hybrid-electric vehicles. The remaining team, Ohio State, did a straight diesel conversion. Of the same top four scoring teams, three used advanced, direct-injected diesel engines, while Virginia Tech employed a propane conversion. These were well-deserved awards, but the scores told only a small part of the FutureCar story. Here are a few highlights (complete results to follow in the next issue of *FutureDrive*):

On a post-competition trip from Dearborn to Chicago, the Lawrence Tech team achieved 65 mpg from their hybrid-electric Taurus, having spent less than \$5 on diesel and electric fuel. On the same trip, Ohio State University also achieved fuel economy in the mid-60s.

Another of the FutureCar winners (who shall remain nameless to protect the innocent) deserves an award for most creative problem-solver. The team discovered a malfunctioning pulley for the steering pump on Sunday during the Challenge. Knowing that the auto parts stores were closed, an enterprising student located an available Intrepid, disassembled it, removed the needed parts, and installed them in the competition vehicle. On Monday, when the stores reopened, the team purchased the needed parts, reassembled the borrowed car, and returned it!

The same 12 schools will have another chance to meet the elusive goal of creating an 80-mpg mid-size vehicle when the 1997 FutureCar Challenge takes place next June.

Shelley Launey  
 Manager of Vehicle Competitions  
 DOE Office of Transportation  
 Technologies

## Propane Proves Advantages as a Production-Ready Fuel

**T**echnological advances in propane are bringing this fuel more in line with the advanced technology available for other alternative fuels. The schools involved in the 1996 Propane Vehicle Challenge (*see p. 1*) converted their vehicles to propane operation in one of three ways: liquid fuel injection, gaseous fuel injection, or gaseous carburetion. Liquid fuel injection has the best potential for reducing emissions and facilitating precise fuel control, resulting in improved performance and driveability. The reason? Liquid propane does not change phase or density when the pressure in the fuel line changes.

The top three winners in the competition represented all of these conversion methods. Texas A&M (first place) used gaseous fuel injection; GMI (second place) used liquid fuel injection; and University of Texas-El Paso (third place) used gaseous carburetion. Almost all of the schools entering the competition positioned the fuel storage tanks under the vehicle; thus, the cargo and passenger space in the vehicle were preserved. GMI used a conformable tank that fit in the same place as the stock gasoline tank.

Other schools who placed in the competition included: The University of Alberta (fourth), followed by Texas Tech/Western Washington, École de technologie supérieure, Cedarville College, Illinois Institute of Technology (IIT), University of Texas-Austin, Villanova University, and University of Oklahoma. All 10 participating entries easily met the range goal; the University of Texas-

El Paso vehicle achieved an extrapolated range of 716 miles after refueling.

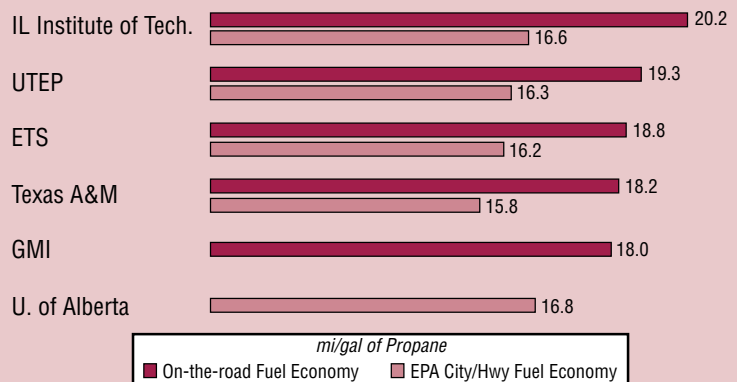
The best fuel economy on the dynamometer was the University of Alberta's vehicle, which achieved 16.8 mpg combined city/highway using propane fuel (23.0 mpg gasoline equivalent). IIT demonstrated the best fuel economy on the road with 20.2 mpg (27.6 mpg gasoline equivalent). The Texas Tech vehicle, with an acceleration time of 11.52 seconds, actually beat the gasoline-powered control vehicle, which took 11.57 seconds. GMI won top honors for design, Texas A&M for emissions, and University of Texas-Austin for best propane conversion. Both Texas A&M and GMI met low-emission vehicle (LEV) standards, and the host school, the University of Windsor (not an official competitor), met the 1997 California ultra-low-emission vehicle (ULEV) standards.



The Propane Vehicle Challenge was cosponsored by the U.S. Department of Energy (DOE), Natural Resources Canada (through CANMET, the Canada Centre for Mineral and Energy Technology), and Chrysler Canada Ltd. Other sponsors included the University of Windsor, Conoco Inc., the National Propane Gas Association, the Propane Gas Association of Canada, Phillips 66, Superior Propane, Thiokol, Sunoco, and Slegers Engineering. The competition was organized and operated by Argonne National Laboratory.

Carlos Buitrago, Engineering Associate, and Marita Moniger, Technical Communicator, Argonne National Laboratory

### 1996 Propane Vehicle Challenge Fuel Economy



CHRYSLER CANADA  
**PROPANE**  
VEHICLE CHALLENGE '96

## Hard Work, Dedication Bring Success to NEAT Students

**W**elcome to Conway, North Carolina, a small farming community and home of the Northampton Electric Auto Team (NEAT). The team designs and builds electric cars that have won top awards at four major electric vehicle competitions: first place overall in the 1994 and 1995 EV Grand Prix (Richmond, Virginia) and the 1995 APS Electrics competition (Phoenix, Arizona) and top finishes in the 1996 APS Electrics and EV Grand Prix competitions.

NEAT was started in 1993, when Harold Miller and Eric Ryan, teachers at Northampton County High School (NCHS) East, accepted a challenge by North Carolina Power for area schools to design and build electric vehicles (EVs). With their first big competition—the EV Grand Prix in Richmond—less than six months away, Miller and Ryan brought together a group of students from four local high schools, who worked long hours to transform a donated 1986 Ford Escort into an efficient electric vehicle.

The result of their efforts, called “Shocker” and powered by 16 golf cart batteries, lived up to its name by winning the overall student competition at Richmond. Shocker traveled at high speed for 64 miles—11 miles farther than its closest competitor—on a single charge. Since then, the team has built another car (Shocker II) and is retrofitting a third vehicle, this time a pickup truck.

With Shocker II, a 1989 Geo Metro, they beat 37 other high school teams from across the country in the 1995 APS Electrics overall student competition in Phoenix and won their second overall student competition in the EV Grand Prix. At this year's APS Electrics competition, the team finished third overall. Judges at that competition were impressed by Shocker II's Horizon batteries, Badicheq system, and Zapi controller—the only such systems in the country used by high schoolers.



But the success of the team goes well beyond collecting awards at EV competitions. Willie Price III, a student who has worked on NEAT as a mechanic since its inception and plans to attend East Carolina State as an electronics major, said that his involvement has taught him “more responsibility working as part of a team.” Shamika Smith, a 1996 graduate of NCHS East who plans to major in mass communications in the spring, believes that “every school should have this kind of program. It combines auto mechanics, communication, science, architecture, drama, production, a lot of involvement from people with different skills—teamwork.”

This year, Ryan and Miller have taken the program one step farther by developing a class, called Electric Vehicle Technology, that combines science, auto mechanics, math, environmental studies, and business and communication. The primary goal of the course, developed with help from REAL (Rural Entrepreneurship through Action Learning), is to combine academics with vocational training that the students can use to succeed in the business world. The course has already become a model for other schools. In fact, Ryan and Miller shared their experiences with teachers from other area schools this summer as part of an Alternative Energy Educational Program sponsored by the Southern Coalition for

Advanced Transportation, in cooperation with Virginia Power, Edison Electric, and the U.S. Department of Energy.

NEAT's next big event is a road rally from Conway to Jackson, North Carolina—a “mini Tour de Sol” as Miller describes it—that will take place in October. Miller expects that between 10 and 18 cars, built by students from across North Carolina and Virginia, will participate in the rally—the first ever sponsored by a high school. NEAT also plans to build a solar-powered charging station in front of the school, due for completion by the end of July.

Thanks to the enthusiasm of the staff at NCHS East and their confidence in the kids; the hardworking, creative students who make up the team; and the involvement of the entire community—from parents to local reporters to sponsors who donate their money and time—NEAT has become a great source of pride in Northampton County. Willie Price has seen how the program has helped his school and community: “It has brought a lot of publicity and shown that, even though we're small and don't have a lot of money, hard work and dedication can bring good things.”

Mary Fitzpatrick  
Technical Communicator  
Argonne National Laboratory



## New EV Range Record Set at American Tour de Sol

**A**s four dozen electric and hybrid-electric vehicles (EVs and HEVs) crossed the finish line of the 8th annual American Tour de Sol on May 16, representatives from government and industry applauded their performance. The 1996 competitors set a new EV range record of 373 miles on a single charge. (See article on p. 1.)

Organized by the Northeast Sustainable Energy Association (NESEA), this week-long road rally was sponsored by the U.S. Department of Energy (DOE), Chrysler Corporation, Goodyear Tire & Rubber Company, and the Northeast Alternative Vehicle Consortium. Entries—more than half of which came from schools (25 colleges/high schools and 1 elementary school)—were divided into five categories: 10 HEVs, 20 commuter EVs, 9 production EVs, 4 open-class EVs, and 3 solar commuter vehicles.

The rally ran from New York City to Washington, D.C., in five legs. Each vehicle was required to carry a kilowatt-hour meter, from which readings were taken each day and converted to miles-per-gallon (mpg) efficiencies. In addition, the energy usage of several vehicles was measured by a chassis dynamometer during federal urban driving simulation (FUDS) and New York City cycle (NYCC) tests. Argonne National Laboratory collected daily energy efficiency data and supervised the NYCC, FUDS, and emissions testing.

**A Winning Combination: American-Made EVs and Nickel Metal Hydride Batteries**  
Two EVs built by Solectria Corpora-

tion in Massachusetts set range records. Both were equipped with nickel metal hydride (NiMH) batteries made by Ovonic in Troy, Michigan; all other entries used lead-acid or nickel-cadmium batteries. Not only did a Solectria Sunrise (lightweight, purpose-built) set the preproduction EV range record of 373 miles, a Solectria Force NiMH (Geo Metro converted to electricity) traveled 244 miles on one charge, setting the record for production EVs. This Sunrise also achieved the best daily efficiency for a conventionally configured EV—102 mpg (total resource). A gasoline-powered Chrysler Neon used as a control vehicle achieved only about 30 mpg on the same day. The best overall efficiency for an EV—82 mpg (total resource)—was achieved by a Solectria Force entered by the Northeast Alternative Vehicle Consortium and Vermont.

Other American-made EVs entering the competition included the Chrysler TEVan and Ford Ecostar. Chrysler's EPIC (electric minivan) and Intrepid ESX (hybrid) were on display during the event, as was the Prowler, an advanced aluminum vehicle.

### HEVs Prove Up to the Task

In the 1996 competition, HEVs were entered as a separate class for the first time. In support of their participation, DOE provided cash awards to winning HEV student teams. An HEV entered by Western Washington University achieved 1997 California ULEV (ultra-low-emission vehicle) emission levels in a standard Federal Test Procedure. It used a stock Neon engine

### ATdS Fuel Economy Results (mpg)

Vehicle	NYCC	FUDS
Solectria Force NiMH EV	80	65
U of W Escort HEV*	21	28
Neon gasoline vehicle	12	25

\*State-of-charge corrected

converted to run on compressed natural gas.

In the road test, a converted Ford Escort wagon entered by the University of Wisconsin achieved the highest efficiency for an HEV—49 mpg (total resource). The Escort demonstrated 20.7 mpg in the NYCC test and 27.9 mpg in the FUDS test. By way of comparison, the Solectria Force NiMH EV achieved 80 mpg in the NYCC test (a result that is not surprising, since the NYCC represents an urban, stop-and-go cycle and dictates that the vehicle spend 40% of the time at idle) and 65 mpg in the FUDS test. The gasoline-powered Neon achieved only 11.6 and 24.9 mpg in the same tests. (See accompanying table.)

Although driver behavior is a big factor in determining variations in a vehicle's fuel economy, a conventional vehicle stopped at a traffic light continues to burn fuel and produce emissions. The fact that electric vehicles were so much more efficient than their gasoline counterparts during a cycle that simulates dense stop-and-go urban driving means that they could "... not only reduce air pollution but also the trade deficit, one-third of which is attributable to oil imports," according to Nancy Hazard of NESEA. EV and HEV technologies are sure to play an important part in our transportation future.

For more details on the competition, visit the NESEA Web site at <http://solstice.crest.org/clients/NESEA>

Marita Moniger  
Technical Communicator  
Argonne National Laboratory



## EV Grand Prix

The 3rd annual *Grand Prix electric vehicle competition* for high schools was held on April 25-27 at the Richmond International Raceway in Virginia. Sponsored and hosted by Virginia Power, this competition involved 15 vehicles built by high school teams. The six-event, nonracing competition was won by Gloucester High School, which also won the acceleration, handling and braking, and range events. It was the winner of the 35-lap event as well. Other top finishers were Northampton and the Hermitage Technical Center. Virginia Power will sponsor and host the event again in 1997.

## American Tour de Sol

On May 10-17, 49 electric and hybrid-electric vehicles (EVs and HEVs) competed in the 8th annual *American Tour de Sol*, organized by the Northeast Sustainable Energy Association. The road rally ran from New York City to Washington, D.C., in five legs. A Solectria Sunrise set a preproduction EV range record for traveling 373 miles without recharging; a Solectria Force NiMH set a production EV range record for going 244 miles on a single charge. The best daily efficiency (49 mpg) and overall efficiency (42 mpg) for HEVs were demonstrated by the University of Wisconsin at Madison. (See articles on pages 1 and 5.)

## Colorado Junior Solar Sprint

Thirty-two teams throughout the state competed in the 4th annual *Colorado Junior Solar Sprint* on May 11. Held at the National Renewable Energy Laboratory's Solar Energy Research Facility in Golden, the competition required students in 7th and 8th grade to supply the chassis, wheels, and transmission for model solar-powered cars. The top three winners in the race were Nevin Platt Choice Program (Boulder), Nevin Platt Middle School (Boulder), and Lake County Intermediate School (Leadville); the top three in the design competition were Broomfield Heights Middle School (Broomfield), Eagle County Charter Academy (Avon), and Nevin Platt Middle School (Boulder).

## Chicago Junior Solar Sprint

The 6th annual *Chicago Junior Solar Sprint*, sponsored by the U.S. Department of Energy (DOE), Argonne National Laboratory, Case Corporation, and the Society of Automotive Engineers, was held on May 18. This national program was developed in 1990 to generate enthusiasm for renewable energy at the middle school level, to improve seventh and eighth grade students' knowledge of these concepts and energy issues, and to encourage young people to consider technical careers. The vehicles participating in this year's competition were judged for design, before competing in a double elimination race, with trophies awarded in both categories. Sixteen schools in the Chicago area participated in this year's events. The top finishers in the competition are listed below.

### Best Design

- 1st Place:** Chas. J. Sahs School, Chicago, Illinois
- 2nd Place:** Eastview Middle School, Bartlett, Illinois
- 3rd Place:** St. John's Lutheran School, LaGrange, Illinois

### Race

- 1st Place:** Pulaski Academy, Chicago, Illinois
- 2nd Place:** Madison Middle School, Naperville, Illinois
- 3rd Place:** Chas. J. Sahs School, Chicago, Illinois
- 4th Place:** Batavia Middle School, Batavia, Illinois
- 5th Place:** St. Damian School, Oak Forest, Illinois

## Formula SAE

Seventy-seven teams entered the *Formula SAE* competition, which gives college students the chance to design, fabricate, and compete with small (up to 600-cc engine) formula-style racing cars. The competition was held at the Pontiac Silverdome in Michigan on May 15-19. Awards for the M-85 class, sponsored by the U.S. Department of Energy, went to the University of Texas at Arlington, which took first place in the overall competition as well as for fuel economy and design/conversion. The University of Akron (Team 13), Penn State, California State University at Northridge, and the

University of Akron (Team 18) took second- through fifth-place awards. Dartmouth College received DOE's Outstanding Teamwork Award.

## Propane Vehicle Challenge

Twelve college teams from the United States and Canada entered the 1996 *Propane Vehicle Challenge*, held May 29-June 4 in Windsor and Toronto, Canada. Students converted 1996 Chrysler minivans to dedicated propane operation for this competition, which was sponsored by the U.S. Department of Energy, Natural Resources Canada, and Chrysler Canada Ltd. Vehicles were tested on their range, exhaust emissions, fuel economy, acceleration, design, and driveability. The winner was Texas A&M, followed by GMI and the University of Texas at El Paso.

## Midwest Supermileage

The 15th annual SAE *Midwest Supermileage* competition was held at the Eaton Corp. Proving Grounds in Marshall, Michigan, on May 31 and June 1. Of the 22 one-person vehicles running on straight iso-octane fuel that showed up for the competition, 18 were allowed to run, and 14 finished six laps on the 1.6-mile oval. One vehicle was entered by a local Boy Scout troop; all the others were entered by college and university students. Fuel economy was the sole criterion for awards. The top five winners were the University of Sherbrooke, Oakland University, Technical University of Nova Scotia, University of South Carolina, and Ryerson Polytechnic University.

## West Coast Supermileage

The 1996 *West Coast Supermileage* competition was held June 9 at the California Highway Patrol Academy in West Sacramento. Eight teams of college/university students in one-person vehicles entered the event, which is sponsored by the Society of Automotive Engineers and the California State Automobile Association. The winner in the iso-octane class was Sierra College (Rocklin, California), which achieved 1,317 mpg. Runners-up were California State University (Fresno), Ohlone College (Fremont, California), and California State University (Fullerton). In the M85 fuel class, Sierra was also the



## COMPETITION UPDATES

winner at 948 mpg, followed by the University of California (Berkeley). Design awards went to CSU-Fullerton, CSU-Fresno, Sierra, and U of C-Berkeley.

### **FutureCar Challenge**

The *FutureCar Challenge* is a multiyear competition aimed at designing and building a mid-size passenger car that can achieve up to 80 mpg. Student teams from 12 North American universities participated in the 1996 events, which took place June 17-24 at Ford's facilities in Dearborn, Michigan. Virginia Tech won first place in the event, followed by

Lawrence Tech University, the University of Wisconsin-Madison, and Ohio State University. Prizes were also given in 20 categories, including efficiency, acceleration, emissions, range, design, and teamwork. The competition is sponsored by the U.S. Department of Energy (DOE) and USCAR. (See *article on p. 2.*)

### **Cleveland Electric Formula Classic**

Indiana University/Purdue University at Indianapolis took the checkered flag in the 3rd annual *Cleveland Electric Formula Classic* held at Burke Lakefront Airport on June 27-30. Finishing second and

third respectively were the University of Oklahoma and Wright State University. This event showcases single-seat, open-wheel electric race cars that resemble Indy cars, with sleek bodies 30 inches high and 163 inches long. It is presented by the Cleveland Electric Illuminating Company, a subsidiary of Centerior Energy. Students at engineering and technical schools install the motors, drive systems, and batteries for the vehicles.

Nicole LeBlanc, Engineering Associate, and Marita Moniger, Technical Communicator, Argonne National Laboratory

## SCHOOL OUTREACH

### **Help Us Show Additional Benefits from Student Vehicle Competitions**

We know that many schools display their competition vehicles at other schools, shopping malls, auto shows, fairs, parades, and elsewhere. The public outreach accomplished by these schools on behalf of new vehicle technologies is enormous but largely unmeasured. For the most part, these extra efforts are also unknown by those who sponsor student vehicle competitions.

To help quantify this school outreach, please send us information on your vehicle use apart from the competitions in which the vehicles are entered. We would also appreciate receiving estimates of the total number of people viewing your vehicle and information about any press clippings, video coverage, video usage logs, etc., during the past 12 months.

Please take a minute to fill in this form, and mail or fax it to:

Philip Patterson, EE-30  
U.S. Department of Energy  
1000 Independence Ave., SW  
Washington, DC 20585

Phone: (202) 586-9121  
Fax: (202) 586-1637  
E-mail: [philip.patterson@hq.doe.gov](mailto:philip.patterson@hq.doe.gov)

We'll share your feedback in an upcoming issue of *FutureDrive*.  
Thank you.

Name of School _____		Type of Vehicle _____	
<b>Student Vehicle Displayed at:</b>			
1.	<b>Schools</b>	<b>Number of Visits or Times</b>	<b>Number of Total People Seeing Vehicle</b>
	1. Grade Schools	_____	_____
	2. Middle Schools	_____	_____
	3. High Schools	_____	_____
	4. Colleges and Universities	_____	_____
2.	<b>Shopping Malls</b>	_____	_____
3.	<b>Parades</b>	_____	_____
4.	<b>Fairs</b>		
	1. County	_____	_____
	2. State	_____	_____
	3. Other	_____	_____
5.	<b>Auto Shows</b>		
	_____	_____	_____
	_____	_____	_____
	<b>City Name</b>	<b>Number of Days</b>	
6.	<b>Other Public Events (list)</b>		
	_____	_____	_____
	_____	_____	_____

## COMPETITION CALENDAR

### 1997 Events

#### March 7-9

##### **APS Electrics**

Electrics and HEVs  
Phoenix, Arizona

♦ **Contact:**

Donald Karner  
Electric Vehicle Technology  
Competitions, L.C.  
tel: (602) 256-2599  
fax: (602) 256-2606

#### **Date to be determined**

##### **EV Grand Prix**

High school electric conversions  
Richmond, Virginia

♦ **Contact:**

Cindy Dickerson  
Virginia Power  
tel: (804) 775-5624

#### **May 17-24**

##### **9th Annual American Tour de Sol**

Road Rally for electrics  
Waterbury, Connecticut, to  
Portland, Maine

♦ **Contact:**

Nancy Hazard  
Northeast Sustainable Energy  
Association  
tel: (413) 774-6051  
fax: (413) 774-6053

#### **Spring 1997**

##### **Colorado Junior Solar Sprint**

Solar cars by 7th- and 8th-graders  
Golden, Colorado

♦ **Contact:**

Linda Lung  
NREL

tel: (800) NEW-ENGY  
(looking for host sites)

#### **May 15-18**

##### **Formula SAE**

Formula-style racing cars  
Pontiac Silverdome, Michigan

♦ **Contact:**

Tony Androsky, SAE  
Educational Relations  
tel: (412) 772-8535

#### **May 14-20 (tentative)**

##### **Propane Vehicle Challenge**

Chrysler Minivans and Dakota  
trucks converted to propane  
operation  
Austin, Texas

♦ **Contact:**

Shelley Launey  
U.S. Department of Energy  
fax: (202) 586-9815  
e-mail: shelley.launey@hq.doe.gov

#### **May 30-31**

##### **Midwest Supermileage**

One-person iso-octane vehicles  
Marshall, Michigan

♦ **Contact:**

Tony Androsky, SAE  
Educational Relations  
tel: (412) 772-8535

#### **June 1997**

##### **FutureCar Challenge**

Mid-sized vehicle conversions  
Dearborn, Michigan

♦ **Contact:**

Shelley Launey  
U.S. Department of Energy  
fax: (202) 586-9815  
e-mail: shelley.launey@hq.doe.gov

#### **June 19-28**

##### **Sunrayce 97**

Biennial intercollegiate solar race  
across America

**Route:** Indianapolis, Indiana, to  
Colorado Springs, Colorado  
Sunrayce 97 Headquarters  
8040 Ortonville Road, Suite A  
Clarkston, Michigan  
tel: (800) 606-8881  
fax: (810) 620-1547

#### **July 17-20**

##### **Cleveland Electric Formula Classic**

Open-wheeled electric race cars  
Cleveland, Ohio

♦ **Contact:**

Donald Karner  
Electric Vehicle Technology  
Competitions, L.C.  
tel: (602) 256-2599  
fax: (602) 256-2606

Events were compiled by  
Kevin Brown, Technical Communi-  
cator, Argonne National Laboratory.



Please keep us informed  
of any changes in names or  
addresses for the *FutureDrive*  
mailing list so we can ensure  
each issue arrives in a timely  
manner to the right person.



Non-Profit Organization  
U.S. Postage Paid  
Lemont, IL  
Permit No. 87